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(54) **Taped bag chain with cassette.**

(57) A bag chain for feeding packaging bags to a bag loader includes bags 2*a*, 2*b*, 2*c* imbricated and carried by a pair of parallel carrier tapes 3 and 4 which are wound up on spools 8 and 9 of a cassette 5. Loading the bag chain in a bag indexing drive unit involves simply placing the cassette 5 into position with the spools 8 and 9 engaged with parallel drive dogs 11 and 12, after which operation of a drive motor 15, driving the dogs 11 and 12 through a differential unit 14-22 indexes the bags 2*a*, 2*b*, 2*c*... and winds up the tapes 3 and 4. Upon complete consumption of the bag chain, the cassette can be removed and replaced by a fresh cassette with the tapes outside the cassette and carrying the imbricated bags.

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TAPED BAG CHAIN WITH CASSETTE

The present invention relates to a chain of taped, imbricated bags, suitable for packaging. For example, meat cuts or poultry may be loaded into the bags.

The use of taped imbricated bags has been known for many years and the most commonly available form of these bags uses two separate adhesive carrier tapes which have an imbricated array of the bags placed on the tapes in such a way that the adhesive face of each tape contacts the exposed part of each bag in the imbricated array. Normally the lead bag of the array is attached to the tapes by its end at which the mouth is disposed.

Such a tape system is disclosed in British Patent Specification No. 1,240,371 in conjunction with a cassette into which the lead ends of the two tapes were introduced. The tapes are pressed with their adhesive faces in contact with one another and this combined tape was then wound around the spool inside the cassette. During feeding of the chain of bags to the bag loader, the tapes were progressively pressed together and wound-up on the spool until, at the end of the chain of bags in question the spool was full of the combined tape assembly and could be removed from the machine and replaced by a fresh spool with a new bag chain attached. Such a cassette system was ideally suited for a bag loader in which the tapes were continuously advanced towards a point of pressing together, from which point onwards the tapes were handled as a single non-adhesive assembly (by virtue of the adhesive faces being in contact with one another).

An alternative proposal for taped imbricated bag chains is disclosed in our British Patent No. 2,064,477B in which the tapes do not converge but remain parallel to one another and are wound-up on coaxial spools between which a differential drive system is positioned. In such

a system the tension in the two tapes can be equal, whereas in the above-mentioned cassette application where the two tapes are pressed into face-to-face adhesive contact the tension in one tape could drop to zero and all the bag-advancing tension could then be transmitted by the other tape with consequent loss of alignment of the bags unless the operator intervened to equalise the length of the tapes.

The advantages of the differential drive system disclosed in British Patent No. 2,064,477B could only be achieved with the penalty of needing to attach the tapes manually onto the coaxial wind-up spools.

It is an object of the present invention to provide a cassette system in the context of a bag loader in which the taped bags are advanced to the loading station by means of a drive unit incorporating differential drive.

A first aspect of the present invention provides a method of loading a bag chain on a bag loader, comprising taking a bag chain incorporating a succession of imbricated packaging bags on two supply tapes from which they are removed during the loading operation, the supply tapes each having a lead end wound on a tape-winding rotor; operating the bag indexing drive unit to bring each of the imbricated bags successively to a loading position where the bag is loaded and separated from the tapes; and, after separation of most or all of the bags from the tapes, removing the tape-winding rotor and built-up tape thereon from the bag indexing drive unit and replacing them by a fresh tape-winding rotor with imbricated taped bags already attached; characterised in that there are two tape-winding rotors each having a respective one of said supply tapes attached; in that said tape-winding rotors are supported on spacing means to hold them with substantially parallel axes of rotation;

in that the tape-winding rotors are attached to parallel drive shafts of a bag indexing drive unit; and in that exchange of a tape build-up by a fresh rotor involves removing both rotors and the spacing means and replacement by a fresh assembly of rotors and spacing means.

A second aspect of the present invention provides a bag chain comprising: a succession of imbricated bags; a pair of side-by-side spaced tapes each having an adhesive face; a tape-winding rotor to which each of said tapes is attached; characterised in that there is a pair of said tape-winding rotors, each rotor having a respective one of the tapes attached for engagement with a tape-winding drive to wind-up the tapes on the drive; and in that there are spacer means supporting the two tape-winding rotors upon substantially parallel axes of rotation, for engagement with parallel axis drive shafts of a tape-winding unit.

A third aspect of the invention provides a bag chain comprising: a succession of imbricated bags; a pair of side-by-side spaced tapes each having an adhesive face; a cassette releasably mountable in a tape winding drive unit and housing a rotor on which said tapes are attached; characterised by a pair of tape-winding rotors in said cassette, each said rotor being attached to a respective one of the tapes and being adapted for engagement with a respective tape winding drive shaft of the tape-winding drive unit to wind-up the tapes on the rotors and said tape-winding rotor having spaced apart substantially parallel axes of rotation.

A fourth aspect of the invention provides a bag chain indexing drive unit comprising: a drive input shaft; and a drive output shaft for a cassette to which a chain of taped imbricated bags is attached; characterised by a pair of spaced apart parallel tape-indexing drive shafts each adapted for engagement with a respective tape-winding

rotor of a bag chain; means for receiving a cassette with two wind-up spools coaxial with the drive shafts; and a differential drive unit between the input shaft and said tape-indexing drive shafts to allow equalisation of tension between the tapes attached to respective tape-winding spools to be associated with the tape-indexing drive shafts.

In order that the present invention may more readily be understood there now follows a brief description, merely by way of example, with reference to the accompanying drawings in which:-

Figure 1 shows a partly cut away perspectiveview of one embodiment of a bag chain and drive unit in accordance with the present invention; and

Figure 2 shows a detail of one of the tape-winding rotors of Figure 1.

In the drawing, a bag chain generally designated 1 comprises an array of imbricated bags 2a, 2b, 2c... placed on two parallel carrier tapes 3 and 4 having their adhesive faces uppermost on the horizontal run of each tape. The leading ends of the tapes 3 and 4 are introduced into a cassette 5 by way of respective inlet openings 6 and 7, respectively. In this particular case the adhesive face of tape 3 is the one nearer to the observer as it passes into the cassette inlet opening 6, and the adhesive face of the tape 4 is the one further from the observer, in each case the adhesive faces being directed radially outwardly when the tapes are attached to respective wind-up spools 8 and 9,

The two wind-up spools 8 and 9 may be floatingly mounted in the cassette 5 so that when the cassette is placed inside a housing for it, defined by a cover 10, each of the spools 8 and 9 can become centered on a respective drive dog 11 and 12 of a cassette drive unit 13.

However, it is preferable for the two wind-up

spools 8 and 9 each to be mounted in the cassette 5 by way of a one-way clutch formation which precludes rotation of the two spools 8 and 9 in the tape-unwinding sense but will allow substantially unlimited rotation in the tape winding-on sense. This offers several advantages: For example, when the cassette drive is switched off there is no risk of the weight of the chain driving the cassette drive in the reverse direction to allow the tape to unwind. Although this first feature can be achieved by having a one-way clutch system in the drive to the drive dogs 11 and 12, such an arrangement would not give any protection against inadvertent unwinding of the bag chain from the cassette when a partially used chain of bags is being removed from the loader and the cassette 5 has been disengaged. To derive this second advantage it is advantageous for the one-way clutch system to be incorporated on the cassette, as in the preferred embodiment of the present invention. A third advantage, to be explained below is that the tapes cannot so readily be replaced by others of a different type of bag chain.

The drive unit 13 comprises an input bevel gear 14 on a drive shaft from a motor 15, and engaging a first vertical bevel gear 16 which carries two idler gears 17 and 18 for rotation about a horizontal axis coincident with the longitudinal axes of two worms 19 and 20. In practice the first vertical bevel gear 16 is freely rotatably mounted around the shaft of the righthand worm gear 20.

The two idler gears 17 and 18 are in constant mesh with a lefthand vertical bevel gear 21 fast with the worm 19, and a righthand vertical bevel gear 22 fast with the worm 20.

The lefthand worm 19 drives a pinion 23 fast with the drive dog 11 of a drive shaft for the lefthand wind-up spool 8 of the cassette 5, whereas the righthand

worm 20 drives a pinion 24 fast with the drive dog 12 of a drive shaft for the righthand wind-up spool 9 of the cassette 5.

From the above description, it will be clear that when the motor 15 rotates, provided the tensions in the two tapes 3 and 4 are equal, the two wind-up spools 8 and 9 will be driven at the same rate of rotation, but in opposite directions of movement (by virtue of appropriate choice of the hand of the two worms 19 and 20 and their pinions 23 and 24, respectively).

When either one of the tapes slackens, the wind-up spool of the other tape slows down, by virtue of the differential mechanism permitted by free rotation of the two idler bevel gears 17 and 18. Thus in normal operation the two bevel gears 17 and 18 are non-rotatable about their own axes (while orbiting around the horizontal common axis of the first vertical bevel gear 16 and the two coaxial worms 19 and 20), but when the differential is effective there will be some rotation of the two idler gears 17 and 18 in addition to their orbiting.

If desired, the cassette 5 may include some means for coding in response to the particular type of bag attached to the chain of which the cassette forms part, so that simply introducing that cassette into the housing defined by the cover 10 will automatically instruct the bag loading equipment as to which type of bag is involved. This coding may, for example, control the width and/or height to which the bag is opened so that the perimeter of the bag mouth is not too tightly stretched in the open and spread condition awaiting the insertion of a product article. The coding means may comprise a mechanical shape of a portion of the cassette, for example a slot or a projection, to actuate a mechanical feeler forming part of the bag opener unit.

Furthermore, if the spools 8 and 9 are freely

rotatably carried by the cassette 5, i.e. without a one-way clutch, it is envisaged that the cassette will be stored, for example during shipping, with the leading part of each of the tapes wound in so that the leading edge of the first bag 2a is substantially against that surface of the cassette 5 in which the openings 6 and 7 are formed, and then before the cassette is loaded into the machine, the cassette will be pulled away from the lead bag 2a so as to uncoil part of each of the tapes 3 and 4 to provide the necessary length of tape between the cassette and the lead bag when the cassette is loaded in the bag loader. Such a system is not possible when the one-way clutches are incorporated, or with the prior art cassette of our British Patent No. 1,240,371, because of the adhesive face-to-face contact of the two tapes at the point where they enter the cassette.

Alternatively each of the tapes 3 and 4 may have a non-adhesive leader portion.

Thus the cassette in accordance with the present invention may provide a much improved way of holding the bags during shipping.

When the two wind-up spools 8 and 9 are freely floating in the cassette 5 these spools are allowed to be accurately centered on their drive dogs 11 and 12 so that in use of the bag chain 1 the spools 8 and 9 will always be positively engaged on the drive dogs 11 and 12.

Both of the cassette types described above, in accordance with the present invention, offer the advantage of a much more rapid way of threading up a bag chain when used with the twin spool differential drive system. It is necessary only to locate the cassette in register with the two drive dogs 11 and 12, and then to press the cassette onto the drive dogs and to close the cover 10 to complete the loading operation, assuming that the bags 2a,2b,2c... are sitting on the loading table in the appropriate position.

In the light of this advantage, it will be realised that the cassette 5 serves as a support means to hold the wind up rotors or spools 8 and 9 ready for rapid mounting on and disconnection from the drive dogs 11 and 12. It is therefore not essential to have a completely enclosed cassette 5 around the spools 8 and 9.

Figure 2 shows a detail of the mounting of the spool 8 of Figure 1 in the cassette body 5. The cassette body has an opening 27 which receives the hollow spindle 26 of the spool 8, the opening 27 being formed with inclined resilient teeth 28 around its periphery, for engagement with oppositely inclined resilient teeth 29 extending radially outwardly from a hub on the flange portion of the spool 8.

As can be appreciated from Figure 2, when the spool 8 rotates in the anti-clockwise direction the tips of the teeth 29 can slip over the tips of the teeth 28, but when clockwise rotation of the spool is attempted, the teeth 29 of the spool lock up against the teeth 28 of the cassette body and prevent rotation.

The splines of the spindle portion 26 of the spool can readily be seen in Figure 2, as can also the build-up 30 of the adhesive tape 3.

It is of course possible for the cassette illustrated in the drawings to be used with a direct drive rather than a differential drive, although the differential drive form is preferred.

In use of the cassette, once one bag chain has been depleted and all or almost all of the bags have been removed from the tapes 3 and 4, the drive motor 15 is operated to retract the exposed ends of the tapes 3 and 4 into the cassette 5, following which the full cassette can be removed and replaced by a fresh, empty cassette already having its bag chain attached. The full cassette which has just been removed can then either be scrapped or processed for removal of the wound-up tape and for re-us

of the cassette.

The coding of the cassette may be achieved in any one of several ways, only a few of which include colour coding of the cassette, or the provision of coding cut-outs or tabs on the body of the cassette, or printing on the cassette, or a label attached to the cassette. Normally the product identification is marked on the box enclosing the bag chain, so once the bag chain has been removed from the box the product identification may be lost. However, the cassette 5 remains attached to the tapes and consequently there is always a secure indication of the product identification. Besides, as indicated earlier, the use of coding apertures or tabs on the cassette can assist in instructing the bag loading machine automatically as regards the machine adjustments which may be necessary on changing from one bag type to another. When the cassette has this "coding" feature it is particularly important for the spools to be prevented from rotating in the unwinding direction to reduce the chance of a particular bag chain being completely removed from its cassette and possibly replaced by another chain having bags with different characteristics than those indicated by the cassette coding.

An advantage of the rapid loading facility offered by the present invention is that the bag loading machine may now have a fixed bag chain support table whereas, hitherto, the more cumbersome bag loading operation has required the availability of at least one spare bag trolley system to allow a bag chain to be attached to the trolley and to have its tapes threaded through the intermeshing gear wheels which press the tapes together in adhesive face-to-face contact so that it is then merely necessary to roll this trolley up to the bag loader when a change of bag chain is needed.

Yet a further advantage of the twin spool system in accordance with the present invention is that there

no risk of damage to the operator or to the bag chain during the loading operation, as is possible with the drive gears used in the prior art systems requiring separation of the gears and threading of the two tapes in face-to-face contact between the gears before again bringing the gears into mesh.

As suggested above, instead of having an enclosed cassette for the tapes, it is of course possible with the method of the present invention to simplify the bag loading operation simply by providing any form of bag tape-driving rotor attached to the lead end of a tape, or to a non-adhesive leader attached to the beginning of the tapes, with means for holding the two rotors in substantially the correct centre-to-centre spacing for rapid connection of the rotors to the drive of the bag indexing unit.

CLAIMS

1. A method of loading a bag chain on a bag loader, comprising taking a bag chain incorporating a succession of imbricated packaging bags on two supply tapes from which they are removed during the loading operation, the supply tapes each having a lead end wound on a tape-winding rotor; operating the bag indexing drive unit to bring each of the imbricated bags successively to a loading position where the bag is loaded and separated from the tapes; and, after separation of most or all of the bags from the tapes, removing the tape-winding rotor and built-up tape thereon from the bag indexing drive unit and replacing them by a fresh tape-winding rotor with imbricated taped bags already attached; characterised in that there are two tape-winding rotors (8,9) each having a respective one of said supply tapes (3,4) attached; in that said tape-winding rotors are supported on spacing means (5) to hold them with substantially parallel axes of rotation; in that the tape-winding rotors are attached to parallel drive shafts (11,12) of a bag indexing drive unit (13); and in that exchange of a tape build-up by a fresh rotor involves removing both rotors (8,9) and the spacing means (5) and replacement by a fresh assembly of rotors and spacing means.

2. A method according to claim 1, characterised in that the tapes each have an adhesive face for attachment to the imbricated bags, and in that a non-adhesive leader attached to each of the tapes and is connected to the respective tape-winding rotor.

3. A bag chain comprising: a succession of imbricated bags (2a, 2b, 2c); a pair of side-by-side spaced tapes (3,4) each having an adhesive face; a tape-winding rotor to which each of said tapes is attached; characterised in that there is a pair of said tape-winding rotors, each rotor having a respective one of

the tapes attached for engagement with a tape-winding drive to wind-up the tapes on the drive; and in that there are spacer means supporting the two tape-winding rotors upon substantially parallel axes of rotation, for engagement with parallel axis drive shafts of a tape-winding unit.

4. A bag chain comprising: a succession of imbricated bags (2a, 2b, 2c); a pair of side-by-side spaced tapes (3,4) each having an adhesive face; a cassette (5) releasably mountable in a tape winding drive unit and housing a rotor on which said tapes are attached; characterised by a pair of tape-winding rotors (8,9) in said cassette, each said rotor (8 or 9) being attached to a respective one of the tapes (3 or 4) and being adapted for engagement with a respective tape winding drive shaft (11 or 12) of the tape-winding drive unit to wind-up the tapes on the rotors and said tape-winding rotor having spaced apart substantially parallel axes of rotation.

5. A bag chain according to claim 4, characterised in that the tape-winding rotors comprise wind-up spools floatingly supported in the cassette.

6. A bag chain according to claim 4 or 5, characterised by including means (28,29) preventing the tape-winding rotors from rotating relative to the cassette body (5) in a tape-unwinding direction, while permitting unlimited rotation in the winding-on direction.

7. A bag chain according to any one of claims 4 to 6, and characterised by including coding means on the cassette for engagement with sensor means of the bag chain indexing drive unit with which the cassette is intended to be used, for adjustment of the bag chain indexing drive unit in response to the particular type of bag in the chain incorporating the cassette.

8. A bag chain indexing drive unit comprising: a drive input shaft; and a drive output shaft for a cassette to which a chain of taped imbricated bags is

attached; characterised by a pair of spaced apart parallel tape-indexing drive shafts (11,12) each adapted for engagement with a respective tape-winding rotor (8,9) of a bag chain; means (10) for receiving a cassette with two wind-up spools coaxial with the drive shafts; and a differential drive unit (14,16-24) between the input shaft and said tape-indexing drive shafts to allow equalisation of tension between the tapes attached to respective tape-winding spools (8,9) to be associated with the tape-indexing drive shafts (11,12).

9. A tape-indexing drive unit according to claim 8, characterised by including sensor means responsive to coding on a cassette which encloses the tape-winding rotors of a said bag chain, for adjustment of the tape-indexing drive unit in response to the particular type of bag in the chain.

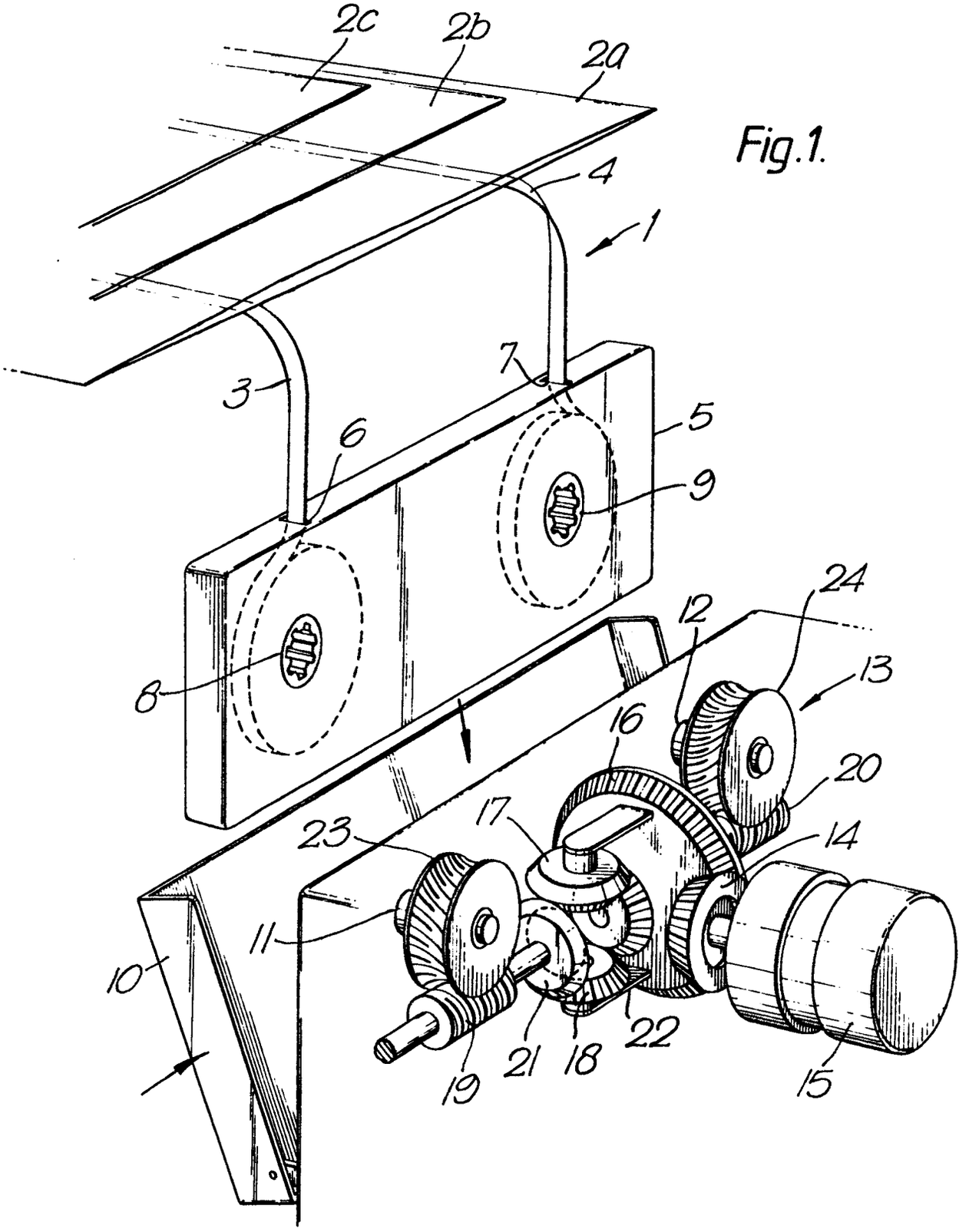
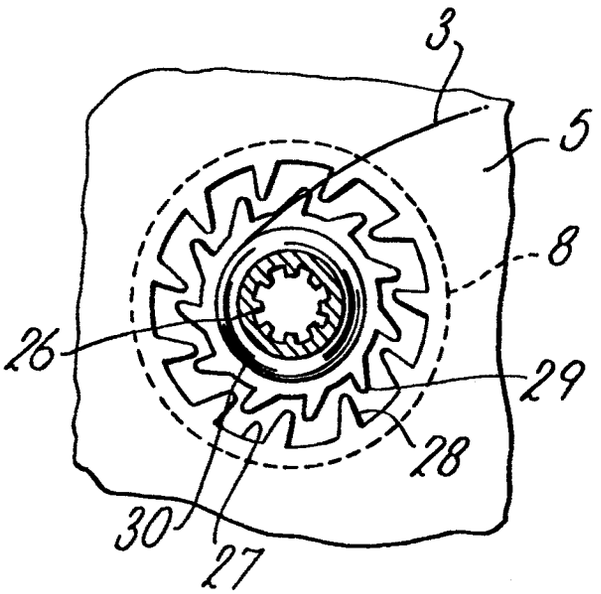


Fig.1.

Fig.2.



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EUROPEAN SEARCH REPORT

0207610
Application number

EP 86 30 3795

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int Cl 4)
A	US-A-3 908 343 (W. FARRELLY) * Column 4, line 46 - column 7, line 50; figures *	1-3,6	B 65 B 43/12
A	US-A-4 032 038 (D. HENDRICKS) * Column 3, line 27 - column 5, line 55; figures *	1,3	

TECHNICAL FIELDS SEARCHED (Int Cl 4)

B 65 B
B 65 H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	16-09-1986	JAGUSIAK A.H.G.

CATEGORY OF CITED DOCUMENTS

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